3. DIGITAL ELECTRONICS

Discipline	COMPUTER SCIENCE				
Course Code	UK1DSCCSC102				
Course Title	DIGITAL ELECTRONICS				
Type of Course	**DSC**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lectures per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	-				
Course Summary	After finishing the course, students will have a solid grasp of digital electronics basics. They will be able to handle different number systems, logic gates, simplify expressions with Boolean algebra, and design digital circuits.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I	**Number Systems**		**15**
	1	Introduction to Number Systems: Binary, Decimal, Octal, and Hexadecimal.	
	2	Conversion between Number Systems.	
	3	Binary Arithmetic (Addition, Subtraction, Multiplication, and Division)	
	4	1's and 2's complement subtraction methods.	
	5	Gray code, BCD and BCD addition	
II	**Logic Gates**		**15**
	6	Basic Gates(AND, OR, NOT), Universal gates(NAND, NOR), XOR and XNOR gates	

	7	Universal property of NAND and NOR gates	
	8	Logic IC's 74 series	
	9	Applications of Logic gates	
III	**Boolean Algebra**		**15**
	10	Basic Laws of Boolean algebra.	
	11	DeMorgan’s theorems.	
	12	SOP, POS, minterm and maxterm	
	13	Simplification of Boolean expressions-Karnaugh Maps.	
IV	**Digital Circuits**		**15**
	14	Multiplexers and Demultiplexers	
	15	Encoders and Decoders	
	16	Adders (Half Adder, Full Adder)	
	17	Flip-Flops (SR, JK, D and T Flip-Flops)	
V	**Flexi Module : Not included for End-Semester Exams**		**15**
	Advanced Digital Systems and Applications		
	18	Registers and Counters: PIPO, SIPO, PISO, SISO, counter design and applications	
	19	Memory units: types, working principle, and interfacing techniques	
	20	Application case study: Digital Signal Processing (DSP), significance, basic building blocks, case study: Designing a digital filter using DSP and implementing it on a microcontroller or FPGA platform	

CORE REFERENCES:

1. Thomas L. Floyd, Digital Fundamentals, Pearson, 11th edition
2. M. Morris Mano, Digital Logic and Computer Design, Pearson, 2023
3. John F. Wakerly, Digital Design: Principles & Practices, Prentice Hall, Third Edition (for Logic IC's 74 series)

LAB EXERCISES

1. Familiarisation of Logic IC’s (AND, OR, NOT, NAND, NOR, XOR and XNOR gates)

2. Implementation of Logical Expressions (Eg: A.(B+C)) - To get practical awareness about simple Boolean Algebra expressions.

3. Construct Half Adder circuit using Logic gates

4. Construct Full Adder circuit using logic gates

5. Construct an SR Flip-Flop.

6. Construct a 2x4 decoder.

7. Construct 2X1 MUX

8. Construct 1X2 DEMUX

Course Outcomes

No.	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Explain the fundamentals of number systems.	U	PSO-1
CO-2	Develop digital circuits using logic gates.	Ap	PSO-1, 2, 3
CO-3	Use the principles of Boolean algebra for simplifying logical expressions.	Ap	PSO-1, 2, 3
CO-4	Construct various combinational digital circuits.	Ap	PSO-1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: DIGITAL ELECTRONICS

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	Explain the fundamentals of number systems.	PSO-1	U	F, C	L	-
2	Develop digital circuits using logic gates.	PSO-1, 2, 3	Ap	F, C, P, M	L	P
3	Use the principles of	PSO-1, 2, 3	Ap	F, C, P, M	L	P

	Boolean algebra for simplifying logical expressions.					
4	Construct various combinational digital circuits.	PSO-1, 2, 3	Ap	F, C, P	L	P

F-Factual, C-Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	-	-	-	-	-	2	1	-	2	-	-	-
CO 2	1	1	-	-	-	2	1	-	2	1	2	-
CO 3	2	3	-	-	-	2	2	-	2	2	2	-
CO 4	1	2	-	-	-	2	2	-	2	2	2	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics: